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(54) LAPAROSCOPE AND ENDOSCOPE CLEANING AND DEFOGGING DEVICE

LAPAROSKOP- UND ENDOSKOPREINIGUNGS- UND -BESCHLAGSCHUTZVORRICHTUNG

DISPOSITIF DE NETTOYAGE ET DE DÉSEMBUAGE DE LAPAROSCOPE ET D'ENDOSCOPE

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Description

TECHNICAL FIELD

[0001] The present invention relates generally to laparoscopic and endoscopic surgery, and more specifically, to a device that warms, cleans, and defogs the laparoscope or endoscope before and during medical procedures that utilize that technology for visualization.

BACKGROUND

[0002] A laparoscope or endoscope is used in conjunction with a camera system for visualization during surgical procedures. When the scope is introduced from ambient room temperature into a cavity at body temperature, the rapid change causes the lens to fog. During surgery, the introduction of surgical tools such as an electrosurgical device deliver energy, creating heat, and vaporizes the intracellular fluid, which increases the pressure inside the cell and eventually causes the cell membrane to burst. When this happens, a plume of smoke containing mostly water vapor is created, along with the aeration of cellular debris. During procedures involving a scope, many times this water vapor, smoke plume, and / or cellular debris attach to the lens, impairing the view of the surgical site. A cleaning device for warming and defogging a laparoscope or an endoscope is disclosed in US 8,152,717.

BRIEF SUMMARY

[0003] The new apparatus and system described and illustrated herein is designed to improve and/or maximize the visualization of the scope during surgical procedures. The invention is defined by independent claims 1, 12 and 13.

[0004] In one aspect, the device has a port located horizontally that is used to warm the scope prior to insertion into the body cavity / surgical site. The scope enters the cavity between two bodies of absorbent material that may or may not contain fluid. The absorbent material is arranged such that the passage of a scope would be accommodated for a size range of 1mm up to 15mm in diameter. A circuit board is located on the bottom of the chamber that has a design element used to warm the liquid to a temperature sufficient to reduce or eliminate issues related to temperature differences between the surrounding environment and the body of the patient. When the scope is located between the two absorbent bodies, the heat generated by the circuit board is transferred to the scope, warming it in preparation for surgery. Also within this chamber is a V-shaped member of white, non-porous material that may be used to white balance the camera. The V-shape allows for multiple different sizes of scopes ranging from 1mm to 15mm to accurately white balance per the camera system procedure.

[0005] In another aspect, a separate stand or cradle is supplied with the device to hold the scope during the warming procedure. When the scope is aligned horizontally, there is a chance that the scope and camera could dislodge from the device and become damaged due to a fall or shock. The stand is designed and supplied with the main device to cradle the scope and camera while in the horizontal position, limiting the possibility of damage from fall or shock.

[0006] The circuit board and electronics of the device are designed such that multiple and separate heater sections are built into the circuit (either flex or rigid construction). The electronic control circuit is designed to maintain temperature of the heating circuit for a period of time for warming the fluid. The heating element is designed with enough resistance to achieve the desired heating performance, and protect against thermal runaway in a single or multiple fault condition. The power supplied to the circuit board can be from a battery or batteries or alternately from a plug-in DC power supply. The battery power supply could be designed in such a way as to be removed separately for waste disposal separately from the main housing. The device would be activated by removing a non-conductive sheet located between the battery contacts, by actuating a switch, or by depressing a button.

[0007] In another aspect, the device has a port located vertically that is used to clean and warm the scope after use in the surgical site. The scope punctures the initial membrane and enters the cavity comprised of a cleaning surface and liquid that has been warmed by the circuit board. The cleaning surface may be comprised of a porous material such as a sponge or non-woven material or it could be comprised of a silicone or similar flexible material in a unique pattern or design for cleaning of the lens. The cleaning surface, along with a warm fluid located in the chamber is used to remove debris and/or fog that has accumulated on the lens during surgery that limits visualization for the user.

[0008] In another aspect, light emitting diodes are included in the device to illuminate both or either of the ports for identification. The LED(s) would illuminate once the heating element has been activated, confirming to the user the device was in-use. Also, during use the illumination of the port or ports would aid the user in identification of the device, especially in operation within a dimly lit room, typical of laparoscopic procedures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Figure 1 is a perspective view of the main body of a scope cleaning device.

Figure 2 is a cross-sectional view of the scope cleaning device of Figure 1 with a stand added.

Figure 3 is a perspective view of the main body and stand of a scope cleaning device.

Figure 4 is a perspective view of the stand of a scope cleaning device.

Figure 5 is a perspective view of the main body and stand separated to highlight the ability to cradle a scope when arranged in the horizontal position.

Figure 6 is a perspective view of an alternate embodiment of the scope cleaning device;

Figure 7 is a rear perspective view of the scope cleaning device of Figure 6.

Figure 8 is an exploded view of the scope cleaning device of Figure 6.

Figure 9 is a cross-sectional view of the scope cleaning device of Figure 6.

Figure 10 is a detailed cross sectional view of a portion of the scope cleaning device of Figure 6.

Figure 11 is a detailed cross sectional view of an alternate embodiment of the scope cleaning device of Figure 6.

Figure 12 is a perspective view of the portion of the scope cleaning device of Figure 6 containing the white balance reference material.

Figure 13 is a side elevational view of the scope cleaning device and a stand for supporting a scope.

Figure 14A is a perspective view of an alternate embodiment of the cleaning material.

Figure 14B is a cross-sectional perspective view of the embodiment shown in Figure 14A.

Figure 15A is a perspective view of another alternate embodiment of the cleaning material.

Figure 15B is a cross-sectional perspective view of the embodiment shown in Figure 15A.

Figure 16 is a schematic diagram of the electrical circuit of the present invention.

DETAILED DESCRIPTION

[0010] Turning to Figure 1, the scope cleaning device 10 has a first opening 13 for receiving a generally vertically oriented scope and a second opening 16 for receiving a generally horizontally oriented scope. A plurality of illumination devices such as light emitting diodes 11 may be disposed around the openings 13, 16 to facilitate the insertion of the surgical scopes in darker environments. The openings 13, 16 may be sealed by a frangible disc 17, 18 made of an elastomeric material or the like. The seals are provided to seal the cleaning solution in the device prior to use. The scope cleaning device has a housing 19 that is closed and sealed to protect the internal compartments from exposure to outside elements. A microfiber wipe 22 may be mounted to the exterior of the housing 19 such that a scope 115 (Figure 13) may be brought into contact with the wipe 22 to remove debris. The device 10 uses separate compartments to clean, warm and white balance a scope.

[0011] Turning to Figure 2, the first opening 13 leads downward to the seal 17. A cavity 28 formed in the body of the housing receives the scope 115. A cleaning material 31 is positioned at the bottom of the cavity 28. The cleaning material 31 may comprise a sponge or other soft, porous material for receiving and holding a cleaning solution 34 (Figure 10). The cleaning material 31 soaks up the liquid and transfers heat to the scope 115. The cleaning solution may be any biocompatible, sterile solution capable of being retained by the cleaning material 31 in the cavity 28. The end of the scope 115 is cleaned and warmed by contact with the cleaning material which may be partially immersed in the heated, cleaning solution 34. A resistance type electrical heating circuit 30 may be located underneath the cleaning material 31. The heating circuit 30 may include resistors on a printed circuit board 35. The electrical circuit 30 for generating heat through the resistors may be powered by a battery 36, battery pack, DC or AC power from an outlet. A battery compartment 38 may be located underneath the circuit board 35.

[0012] On the right hand side of the figure, second opening 16 extends to a second horizontally disposed cavity 37 for receiving the scope 115. The horizontally disposed cavity 37 may contain a pair of sponges or a cleaning material 39 that is split to provide a channel for sliding the scope 115 through the cleaning material 39. The two sponges are configured to accept and to warm scopes 115 of all sizes. A V-shaped white reference material 40 is disposed at the end of the cavity 37. The white balance reference material 40 is constructed of a non-porous material such as a silicone. The white balance reference material 40 does not hold any liquid or cleaning solution and is arranged to provide a white balance for providing a reference color for optimizing the camera. The white balance reference material 40 is V-shaped so that scopes 115 of different diameters may be inserted through the cleaning material 39 and into contact with the white balance reference material 40.

[0013] A stand 46 is shown in a position abutting with the housing 19. The stand 46 may also be disposed in spaced apart relation as shown in Figures 5 and 13. The stand 46 provides support for the scope 115 while it is inserted into the horizontally oriented cavity 37.

[0014] Turning to Figures 3 and 4, the stand 46 may be provided with an opening 49 bordered by a curved upper surface 50. The stand 46 may have a flat base 52 and a pair of side walls 55, 58. The side walls 55, 58

extend to a top surface 61a, 61b that borders the opening 49. The opening 49 is sized to be larger than the outside diameter of the scope 115 such that the scope 115 may slide into and out of the opening 49.

[0015] In Figure 5, the stand 46 is disposed in spaced apart relation relative to the scope cleaning device 10. The stand 46 is disposed such that a scope 115 deployed in opening 16 will align with the opening 49 at the top of the stand 46.

[0016] In Figures 6 and 7, scope cleaning device 100 is an alternate embodiment of scope cleaning device 10. The device 100 includes a housing 103 having a first opening 106 and a second opening 109. A microfiber wipe 112 may be disposed at the top of the housing 103 for manually wiping off a scope 115. As shown, the housing 103 may extend outward in both directions toward the base 118 of the device 110. The wider portion of the housing 103 at the base 118 provides for greater stability when inserting the scope 115.

[0017] As shown in Figures 8 and 9, the device 100 includes the microfiber wipe 112 at the top of the housing 103. The housing 103 is a formed from a hollow shell 121 that forms internal cavities and protects the interior components from exposure to external elements. The first opening 106 may extend to a first chamber 124 (FIG. 9) formed in a subhousing 127. The subhousing 127 has an opening 130 at the top that provides a seal. The exterior of subhousing 127 may be formed on the right hand side with a V-shaped section that receives a white balance reference material 133. The subhousing 127 may be received on top of subhousing 136 that forms a base for supporting subhousing 127, printed circuit board 139, a first cleaning material 142 such as a sponge or the like disposed in subhousing 127, and a second cleaning material 145 that is disposed in a horizontal chamber 148 (FIG.9). The second cleaning material 145 may comprise a pair of sponges 145a and 145b (best shown in FIG. 12) or cloths or may comprise a split cleaning material having a channel formed therein for receiving the scope 115. The subhousing 136 provides an enclosure for a battery compartment 151. The batteries 154 may be arranged on a base 155 in a circuit for providing heat through electrical resistance in the printed circuit board 139. The circuit board 139 may be designed to have multiple and separate heater sections built in to the circuit. The circuit may be rigid or flexible. The device is provided with an electronic control circuit to maintain printed circuit board (PCB) temperature of the heating circuit for warming the cleaning fluid. The heater is designed with enough resistance to allow heating, but to still protect against thermal runaway in a fault condition. The system may be provided with light emitting diodes or LED's to illuminate the separate ports for cleaning and white balance. The system may be provided with an on-off switch or there may simply be an insulating pull tab 157 that can be removed to complete the circuit. As shown in Figure 9, two compartments are formed above the printed circuit board 139. The cleaning fluid 34 (Figure 10) is warmed by the printed circuit board 139 and the warmed cleaning fluid 34 may be absorbed into the first and second cleaning materials 142 and 145. Accordingly, when a scope 115 is inserted into the first opening 106, the scope 115 can be pushed into contact with the cleaning material 142 to clean the end of the scope and to warm it for reinsertion into the cavity of the patient. When a scope 115 is inserted into the second opening 109, the scope 115 slides between the two sides 145a and 145b of the second cleaning material 145 such that a cleaning solution wipes off the scope 115 as it slides past. The scope 115 extends to the V-shaped white balance reference material 133 where it may be inserted until it makes contact. Because of the V-shape, the white balance reference material 133 is capable of accommodating scopes 115 having many different diameters.

[0018] Turning to Figure 10, the cleaning fluid 34 may be contained in one or both of the chambers located above the printed circuit board 139. As shown, the fluid level may extend above the first cleaning material 142 and, if present in the second chamber 148, may extend for a majority of the height of the second cleaning material 145. The white balance reference material 133 is located above the fluid level as fluid on the white balance reference material 133 would disrupt the white balancing and would not produce good results for the imaging. As an alternative, the first and second chamber 124, 148 may be separate and the second chamber 148 may not contain fluid. The white balance reference material 133 is preferably a non-porous silicone material that does not absorb or retain any cleaning fluid solution. Turning to Figure 11, the first cleaning material 142 may comprise a sponge or it may comprise a cross-hatched silicone cleaning material 170. The cross-hatched silicone material 170 may provide superior cleaning of the surface of the scope in comparison to a sponge. The use of a silicone or similar flexible material in a cross hatched pattern provides additional surface area for the cleaning material and provides improved cleaning of the lens.

[0019] In Fig. 12, the arrangement of the horizontal cavity is shown in greater detail. The second opening 109 extends to a chamber having a pair of sponges 145a and 145b with a longitudinal channel 146 disposed between the sponges. A white balance reference material 133 is disposed in spaced apart relation from the end of the sponges. The scope 115 may extend through the channel 146 between the sponges and may extending into contact with the white balance reference material 133 for white balancing according to the specifications for the camera. As shown in Figure 13, the stand 46 may be disposed in spaced apart relation to the scope cleaning device 100 so that the scope 115 may be supported in a substantially horizontal configuration.

[0020] Turning to Figs. 14A-14B, an alternate embodiment of the cleaning material 31 in the first cavity 28 is shown. Cleaning material 231 includes a plurality of upstanding finger-like projections 234. The finger-like projections 234 provide a surface for cleaning a surgical

scope inside the cavity 28.

[0021] In Figure 15A-15B, an another alternate embodiment of the cleaning material 31 is shown. A honeycomb like structure 251 includes a plurality of openings 254 divided by connecting walls 257.

[0022] Figure 16 is a schematic diagram of one embodiment of the electrical circuit. The circuit 299 includes a power source such as a battery 300; a heating element 303; a thermistor 306; a plurality of LED's 309, 312; and a plurality of resistors 315, 318, 321, and 324. The circuit components may be integrated into a single printed circuit board. With the heater and components integrated into one board, any heat generated by the power transistor 327 which controls the power going to the heating element 303 is also used to warm the fluid. Also, with the temperature sensor (thermistor 306) integrated into the same board that includes the heating element, there is little to no latency in sensing temperature changes. In the case of a battery powered circuit, the circuit may electronically adjust for the varying voltage over the battery life with pulse width modulation. This feature may be used to maintain the required temperature setpoint of the device over the expected range of four to six hours.

[0023] The present invention contemplates that many changes and modifications may be made. Therefore, while the presently-preferred form of the emissions measuring system has been shown and described, and several modifications and alternatives discussed, persons skilled in this art will readily appreciate that various additional changes and modifications may be made without departing from the scope of the invention, as defined and differentiated by the following claims.

Claims

1. Cleaning and defogging device for use with a surgical scope during medical procedures, the device comprising:

   a housing (19, 103) defining a first cavity (28) and a second cavity (37), the first cavity (28) configured and arranged to receive a surgical scope in a generally vertical orientation, the second cavity (37) configured and arranged to receive a surgical scope in a generally horizontal configuration, the housing (19, 103) having a first inlet (13, 106) communicating with the first cavity (28) to allow a distal end of the surgical scope to be inserted into the first cavity (28) through the first inlet (13, 106), the housing (19, 103) having a second inlet (18, 109) communicating with the second cavity (37) to allow a distal end of the surgical scope to be inserted into the second cavity (37) through the second inlet (18, 109);
   a cleaning fluid (34) disposed in the first cavity (28);
   a heating element (303) disposed in the housing (19, 103) such that heat is transferred from the heating element (303) to the cleaning fluid (34);
   a V-shaped surface configured and arranged to receive a white balance referencing material (40, 133), the V-shaped surface disposed inside the housing (19, 103) adjacent to the second cavity (37); and
   a power source (300) configured and arranged to energize the heating element (303) to produce heat for heating the cleaning fluid (34).

2. Device according to Claim 1, further comprising a cleaning material (31, 42, 142, 231) disposed in the first cavity (28).

3. Device according to Claim 2, wherein the cleaning material (42, 142) comprises a sponge, a flexible material having a cross-hatched pattern, a plurality of upstanding finger-like projections (234), or a material having a honeycomb-like structure (251).

4. Device according to any one of Claims 1 to 3, wherein the first cavity (28) and the second cavity (37) are disposed in fluid communication, wherein preferably the cleaning fluid (34) is disposed in the first (28) and second cavity (37) and is capable of moving therebetween.

5. Device according to any one of Claims 1 to 4, further comprising an illumination source (11) disposed adjacent to at least one of the first (13, 106) and second inlets (18, 109).

6. Device according to any one of Claims 1 to 5, further comprising a stand (46) disposed in spaced apart relation to the second inlet (18, 109), the stand (46) configured and arranged to support the proximal end of the surgical scope when the distal end of the surgical scope is disposed in the second cavity (37).

7. Device according to any one of Claims 1 to 6, further comprising a first subhousing (127) having an upper surface and having a first subhousing cavity defined therein, wherein preferably the upper surface of the subhousing (127) is configured and arranged to support a circuit board having a heating element (303) disposed thereon.

8. Device according to Claim 7, further comprising a power source (300) disposed inside the subhousing cavity, wherein preferably the power source (300) comprises a plurality of batteries (300), and/or a second subhousing having a chamber forming the first cavity (28) and having a V -shaped exterior surface for receiving the white balance reference material (40, 133).

9. Device according to any one Claims 1 to 8, further comprising a second cleaning material (145) disposed in the second cavity (37), the second cleaning material (145) having a first portion and a second portion disposed in spaced apart relation such that a gap is formed between the first and second portions, the surgical scope being received in the gap and making contact with the first and second portions when the surgical scope is inserted into the second cavity (37) through the second inlet (18, 109).

10. Device according to any one of Claims 1 to 9, wherein the heating element (303) is a resistance type electrical heating element (303) incorporated into an electrical circuit, wherein preferably the electrical circuit comprises a printed circuit board (139) and/or a thermistor (306) for controlling the temperature of the cleaning fluid (34) within the housing (19, 103).

11. Device according to Claim 10, wherein the circuit electronically adjusts for varying voltage over the life of a battery (300) by pulse width modification and/or wherein the thermistor (306) and the heating element (303) are incorporated into a single printed circuit board (139).

12. Cleaning and defogging device for use with a surgical scope during medical procedures, the device comprising:

a housing (19, 103) defining a first cavity (28) and a second cavity (37), the first cavity (28) configured and arranged to receive a surgical scope in a generally vertical orientation, the second cavity (37) configured and arranged to receive a surgical scope in a generally horizontal configuration, the first cavity (28) and second cavity (37) disposed in fluid communication, the housing (19, 103) having a first inlet (13, 106) communicating with the first cavity (28) to allow a distal end of the surgical scope to be inserted into the first cavity (28) through the first inlet (13, 106), the housing (19, 103) having a second inlet communicating with the second cavity (37) to allow a distal end of the surgical scope to be inserted into the second cavity (37) through the second inlet;
a cleaning fluid (34) disposed in the first cavity (28) and second cavity (37) and capable of moving therebetween;
a heating element (303) disposed in the housing (19, 103) such that heat is transferred from the heating element (303) to the cleaning fluid (34);
a power source (300) configured and arranged to energize the heating element (303) to produce heat for heating the cleaning fluid (34); and,
wherein a white balance reference material (40, 133) is disposed in the second cavity (37) above the level of the cleaning fluid (34).

13. Cleaning and defogging device for use with a surgical scope during medical procedures, the device comprising:

a housing (19, 103) defining a first cavity (28) and a second cavity (37), the first cavity (28) configured and arranged to receive a surgical scope in a generally vertical orientation, the second cavity (37) configured and arranged to receive a surgical scope in a generally horizontal configuration, the first cavity (28) and second cavity (37) disposed in fluid communication, the housing (19, 103) having a first inlet (13, 106) communicating with the first cavity (28) to allow a distal end of the surgical scope to be inserted into the first cavity (28) through the first inlet (13, 106), the housing (19, 103) having a second inlet communicating with the second cavity (37) to allow a distal end of the surgical scope to be inserted into the second cavity (37) through the second inlet;
a first cleaning material disposed in the first cavity (28);
a white balance reference material (40, 133) disposed in the housing (19, 103) and configured and arranged to white balance (40, 133)a surgical scope disposed in the housing (19, 103);
a cleaning fluid (34) disposed in the first cavity (28);
an electrical circuit having a heating element (303) operatively associated therewith, the heating element (303) disposed in the housing (19, 103) such that heat is transferred from the heating element (303) to the cleaning fluid (34);
a power source (300) configured and arranged to energize the heating element (303) to produce heat for heating the cleaning fluid (34);
wherein the housing (19, 103) has a first subhousing (127) and a second subhousing disposed therein, the first subhousing (127) having an upper surface and having a first subhousing cavity defined therein, the heating element (303) disposed on the upper surface, the power source (300) disposed in the first subhousing cavity, the second subhousing forming the first cavity (28) and having a V-shaped exterior surface configured and arranged to receive the white balancing reference material.

14. Device according to Claim 13, wherein the upper surface of the first subhousing (127) is disposed underneath the first cavity (28) in the housing (19, 103) to warm the cleaning fluid (34).

15. Device according to Claims 13 or 14, wherein the electrical circuit comprises a printed circuit board

(139).

Patentansprüche

1. Reinigungs- und Antibeschlag-Vorrichtung zur Verwendung mit einem chirurgischen Endoskop während medizinischer Maßnahmen, wobei die Vorrichtung umfasst:

   ein Gehäuse (19, 103), das einen ersten Hohlraum (28) und einen zweiten Hohlraum (37) definiert, wobei der erste Hohlraum (28) ausgelegt und angeordnet ist, um ein chirurgisches Endoskop in einer im Allgemeinen vertikalen Ausrichtung aufzunehmen, der zweite Hohlraum (37) ausgelegt und angeordnet ist, um ein chirurgisches Endoskop in einer im Allgemeinen horizontalen Ausrichtung aufzunehmen, wobei das Gehäuse (19, 103) einen ersten Eingang (13, 106) aufweist, der mit dem ersten Hohlraum (28) in Verbindung steht, um zu ermöglichen, dass ein distales Ende des chirurgischen Endoskops in den ersten Hohlraum (28) durch den ersten Eingang (13, 106) eingeführt wird, wobei das Gehäuse (19, 103) einen zweiten Eingang (18, 109) aufweist, der mit dem zweiten Hohlraum (37) in Verbindung steht, um zu ermöglichen, dass ein distales Ende des chirurgischen Endoskops durch den zweiten Eingang (18, 109) in den zweiten Hohlraum (37) eingeführt wird;
   ein Reinigungsfluid (34), das in dem ersten Hohlraum (28) angeordnet ist;
   ein Heizelement (303), das in dem Gehäuse (19, 103) so angeordnet ist, dass Wärme von dem Heizelement (303) auf das Reinigungsfluid (34) übertragen wird;
   eine V-förmige Oberfläche, die so ausgelegt und angeordnet ist, dass sie ein Weißabgleich-Referenzmaterial (40, 133) aufnimmt, wobei die V-förmige Oberfläche innerhalb des Gehäuses (19, 103) angrenzend an den zweiten Hohlraum (37) angeordnet ist; und
   eine Stromquelle (300), die so ausgelegt und angeordnet ist, dass sie das Heizelement (303) zum Erzeugen von Wärme zum Erwärmen des Reinigungsfluids (34) unter Spannung setzt.

2. Vorrichtung nach Anspruch 1, des Weiteren umfassend ein Reinigungsmaterial (31, 42, 142, 231), das in dem ersten Hohlraum (28) angeordnet ist.

3. Vorrichtung nach Anspruch 2, bei der das Reinigungsmaterial (42, 142) einen Schwamm, ein flexibles Material mit einem kreuzschraffierten Muster, eine Vielzahl von aufrecht stehenden fingerartigen Vorsprüngen (234) oder ein Material mit einer wabenartigen Struktur (251) umfasst.

4. Vorrichtung nach einem der Ansprüche 1 bis 3, bei der der erste Hohlraum (28) und der zweite Hohlraum (37) in Fluidverbindung angeordnet sind, wobei vorzugsweise die Reinigungsflüssigkeit (34) in dem ersten Hohlraum (28) und in dem zweiten Hohlraum (37) angeordnet ist und sich dazwischen bewegen kann.

5. Vorrichtung nach einem der Ansprüche 1 bis 4, ferner umfassend eine Beleuchtungsquelle (11), die benachbart zu mindestens einem von den ersten Eingang (13, 106) und zweiten Eingang (18, 109) angeordnet ist.

6. Vorrichtung nach einem der Ansprüche 1 bis 5, ferner umfassend einen Ständer (46), der in beabstandeter Beziehung zu dem zweiten Eingang (18, 109) vorgesehen ist, wobei der Ständer (46) so ausgelegt und angeordnet ist, dass er das proximale Ende des chirurgischen Endoskops trägt, wenn das distale Ende des chirurgischen Endoskops in dem zweiten Hohlraum (37) angeordnet ist.

7. Vorrichtung nach einem der Ansprüche 1 bis 6, ferner umfassend ein erstes Untergehäuse (127), das eine Oberseite aufweist und einen darin definierten ersten Untergehäusehohlraum aufweist, wobei vorzugsweise die Oberseite des Untergehäuses (127) ausgelegt und angeordnet ist, um eine Leiterplatte mit einem darauf angeordneten Heizelement (303) zu stützen.

8. Vorrichtung nach Anspruch 7, ferner umfassend eine innerhalb des Untergehäusehohlraums angeordnete Stromquelle (300), wobei vorzugsweise die Stromquelle (300) eine Vielzahl von Batterien (300) umfasst, und/oder ein zweites Untergehäuse, das eine den ersten Hohlraum (28) bildenden Kammer aufweist und eine V-förmige Außenfläche zur Aufnahme des Weißabgleich-Referenzmaterials (40, 133) aufweist.

9. Vorrichtung nach einem der Ansprüche 1 bis 8, ferner umfassend ein zweites Reinigungsmaterial (145), das in dem zweiten Hohlraum (37) angeordnet ist, wobei das zweite Reinigungsmaterial (145) einen ersten Abschnitt und einen zweiten Abschnitt aufweist, die in einer voneinander beabstandeten Beziehung angeordnet sind, so dass ein Spalt zwischen dem ersten und dem zweiten Abschnitt gebildet ist, wobei das chirurgische Endoskop in dem Spalt aufgenommen wird und mit dem ersten und dem zweiten Abschnitt in Kontakt kommt, wenn das chirurgische Endoskop durch den zweiten Eingang (18, 109) in den zweiten Hohlraum (37) eingeführt wird.

10. Vorrichtung nach einem der Ansprüche 1 bis 9, bei der das Heizelement (303) ein in eine elektrische

Schaltung integriertes elektrisches Widerstandsheizelement (303) ist, wobei vorzugsweise die elektrische Schaltung eine Leiterplatte (139) und/oder einen Thermistor (306) zum Steuern der Temperatur der Reinigungsflüssigkeit (34) innerhalb des Gehäuses (19, 103) umfasst.

11. Vorrichtung nach Anspruch 10, bei der die Schaltung elektronisch für sich über die Lebensdauer einer Batterie (300) ändernde Spannung durch Pulsweitenänderung Anpassungen vornimmt und/oder bei der der Thermistor (306) und das Heizelement (303) in eine einzige Leiterplatte (139) integriert sind.

12. Reinigungs- und Antibeschlag-Vorrichtung zur Verwendung mit einem chirurgischen Endoskop während medizinischer Maßnahmen, wobei die Vorrichtung umfasst:

ein Gehäuse (19, 103), das einen ersten Hohlraum (28) und einen zweiten Hohlraum (37) definiert, wobei der erste Hohlraum (28) ausgelegt und angeordnet ist, um ein chirurgisches Endoskop in einer im Allgemeinen vertikalen Ausrichtung aufzunehmen, der zweite Hohlraum (37) ausgelegt und angeordnet ist, um ein chirurgisches Endoskop in einer im Allgemeinen horizontalen Ausrichtung aufzunehmen, wobei der erste Hohlraum (28) und der zweite Hohlraum (37) in Fluidverbindung angeordnet sind, wobei das Gehäuse (19, 103) einen ersten Eingang (13, 106) aufweist, der mit dem ersten Hohlraum (28) in Verbindung steht, um zu ermöglichen, dass ein distales Ende des chirurgischen Endoskops in den ersten Hohlraum (28) durch den ersten Eingang (13, 106) eingeführt wird, und wobei das Gehäuse (19, 103) einen zweiten Eingang aufweist, der mit dem zweiten Hohlraum (37) in Verbindung steht, um zu ermöglichen, dass ein distales Ende des chirurgischen Endoskops durch den zweiten Eingang in den zweiten Hohlraum (37) eingeführt wird;
ein Reinigungsfluid (34), das in dem ersten Hohlraum (28) und in dem zweiten Hohlraum (37) angeordnet ist und in der Lage ist, sich dazwischen zu bewegen;
ein Heizelement (303), das in dem Gehäuse (19, 103) so angeordnet ist, dass Wärme von dem Heizelement (303) auf das Reinigungsfluid (34) übertragen wird;
eine Stromquelle (300), die so ausgelegt und angeordnet ist, dass sie das Heizelement (303) zum Erzeugen von Wärme zum Erwärmen des Reinigungsfluids (34) unter Spannung setzt; und
wobei ein Weißabgleich-Referenzmaterial (40, 133) in dem zweiten Hohlraum (37) oberhalb des Spiegels des Reinigungsfluids (34) angeordnet ist.

13. Reinigungs- und Antibeschlag-Vorrichtung zur Verwendung mit einem chirurgischen Endoskop während medizinischer Maßnahmen, wobei die Vorrichtung umfasst:

ein Gehäuse (19, 103), das einen ersten Hohlraum (28) und einen zweiten Hohlraum (37) definiert, wobei der erste Hohlraum (28) ausgelegt und angeordnet ist, um ein chirurgisches Endoskop in einer im Allgemeinen vertikalen Ausrichtung aufzunehmen, der zweite Hohlraum (37) ausgelegt und angeordnet ist, um ein chirurgisches Endoskop in einer im Allgemeinen horizontalen Ausrichtung aufzunehmen, wobei der erste Hohlraum (28) und der zweite Hohlraum (37) in Fluidverbindung angeordnet sind, wobei das Gehäuse (19, 103) einen ersten Eingang (13, 106) aufweist, der mit dem ersten Hohlraum (28) in Verbindung steht, um zu ermöglichen, dass ein distales Ende des chirurgischen Endoskops in den ersten Hohlraum (28) durch den ersten Eingang (13, 106) eingeführt wird, und wobei das Gehäuse (19, 103) einen zweiten Eingang aufweist, der mit dem zweiten Hohlraum (37) in Verbindung steht, um zu ermöglichen, dass ein distales Ende des chirurgischen Endoskops durch den zweiten Eingang in den zweiten Hohlraum (37) eingeführt wird;
ein erstes Reinigungsmaterial, das in dem ersten Hohlraum (28) angeordnet ist;
ein Weißabgleich-Referenzmaterial (40, 133) in dem Gehäuse (19, 103) vorgesehen ist und zum Weißabgleich (40, 133) für ein im Gehäuse (19, 103) angeordnetes chirurgisches Endoskop ausgelegt und angeordnet ist;
ein Reinigungsfluid (34), das in dem ersten Hohlraum (28) angeordnet ist;
ein elektrischer Schaltkreis, der ein damit funktionell verbundenes Heizelement (303) aufweist, wobei das Heizelement (303) in dem Gehäuse (19, 103) so angeordnet ist, dass Wärme von dem Heizelement (303) auf das Reinigungsfluid (34) übertragen wird;
eine Stromquelle (300), die so ausgelegt und angeordnet ist, dass sie das Heizelement (303) zum Erzeugen von Wärme zum Erwärmen des Reinigungsfluids (34) unter Spannung setzt; und
wobei das Gehäuse (19, 103) ein erstes Untergehäuse (127) und ein darin angeordnetes zweites Untergehäuse aufweist, wobei das erste Untergehäuse (127) eine Oberseite aufweist und einen darin definierten ersten Untergehäusehohlraum aufweist, das Heizelement (303) auf der Oberseite angeordnet ist, die Stromquelle (300) im ersten Untergehäusehohlraum an-

geordnet ist, das zweite Untergehäuse den ersten Hohlraum (28) bildet und eine V-förmige Außenfläche aufweist, die ausgelegt und angeordnet ist, um das Weißabgleich-Referenzmaterial aufzunehmen.

14. Vorrichtung nach Anspruch 13, wobei die Oberseite des ersten Untergehäuses (127) unter dem ersten Hohlraum (28) im Gehäuse (19, 103) angeordnet ist, um die Reinigungsflüssigkeit (34) zu erwärmen.

15. Vorrichtung nach Anspruch 13 oder 14, wobei die elektrische Schaltung eine Leiterplatte (139) umfasst.

Revendications

1. Dispositif de nettoyage et de désembuage à utiliser avec un appareil de scopie chirurgicale pendant des procédures médicales, le dispositif comprenant :

un boîtier (19, 103) définissant une première cavité (28) et une seconde cavité (37), la première cavité (28) étant configurée et agencée pour recevoir un appareil de scopie chirurgicale dans une orientation généralement verticale, la seconde cavité (37) étant configurée et agencée pour recevoir un appareil de scopie chirurgicale dans une configuration généralement horizontale, le boîtier (19, 103) ayant une première entrée (13, 106) communiquant avec la première cavité (28) pour permettre d'insérer une extrémité distale de l'appareil de scopie chirurgicale jusque dans la première cavité (28) à travers la première entrée (13, 106), le boîtier (19, 103) ayant une seconde entrée (18, 109) communiquant avec la seconde cavité (37) pour permettre d'insérer une extrémité distale de l'appareil de scopie chirurgicale jusque dans la seconde cavité (37) à travers la seconde entrée (18, 109) ;
un fluide de nettoyage (34) disposé dans la première cavité (28) ;
un élément chauffant (303) disposé dans le boîtier (19, 103) de telle sorte que de la chaleur est transférée depuis l'élément chauffant (303) vers le fluide de nettoyage (34) ;
une surface en forme de V configurée et agencée pour recevoir un matériau de référence pour équilibrage de blanc (40, 133), la surface en forme de V étant disposée à l'intérieur du boîtier (19, 103) en position adjacente à la seconde cavité (37) ; et
une source de puissance (300) configurée et agencée pour alimenter l'élément chauffant (63) afin de produire de la chaleur pour chauffer le fluide de nettoyage (38).

2. Dispositif selon la revendication 1, comprenant en outre un matériau de nettoyage (31, 42, 142, 231) disposé dans la première cavité (28).

3. Dispositif selon la revendication 2, dans lequel le matériau de nettoyage (42, 142) comprend une éponge, un matériau souple ayant un motif hachuré en croix, une pluralité de projections dressées semblables à des doigts (234), ou un matériau ayant une structure semblable à un nid-d'abeilles (251).

4. Dispositif selon l'une quelconque des revendications 1 à 3, dans lequel la première cavité (28) et la seconde cavité (37) sont disposées en communication fluidique, dans lequel de préférence le fluide de nettoyage (34) est disposé dans la première cavité (28) et dans la seconde cavité (37) et est capable de se déplacer entre celles-ci.

5. Dispositif selon l'une quelconque des revendications 1 à 4, comprenant en outre une source d'illumination (11) disposée adjacente à l'une au moins de la première entrée (13, 106) et de la seconde entrée (18, 109).

6. Dispositif selon l'une quelconque des revendications 1 à 5, comprenant en outre un support (46) disposé en relation d'espacement par rapport à la seconde entrée (18, 109), le support (46) étant configuré et agencé pour supporter l'extrémité proximale de l'appareil de scopie chirurgicale quand l'extrémité distale de l'appareil de scopie chirurgicale est disposée dans la seconde cavité (37).

7. Dispositif selon l'une quelconque des revendications 1 à 6, comprenant en outre un premier boîtier annexe (127) ayant une surface supérieure et dans lequel est définie une cavité de premier boîtier annexe, dans lequel de préférence la surface supérieure du boîtier annexe (127) est configurée et agencée pour supporter une carte à circuits ayant un élément chauffant (303) disposé sur celle-ci.

8. Dispositif selon la revendication 7, comprenant en outre une source de puissance (300) disposée dans la cavité de boîtier annexe, dans lequel de préférence la source de puissance (300) comprend une pluralité de batteries (300), et/ou un second boîtier annexe ayant une chambre formant la première cavité (28) et ayant une surface extérieure en forme de V afin de recevoir le matériau de référence pour équilibrage de blanc (40, 133).

9. Dispositif selon l'une quelconque des revendications 1 à 8, comprenant en outre un second matériau de nettoyage (145) disposé dans la seconde cavité (37), le second matériau de nettoyage (145) ayant une première portion et une seconde portion disposées

dans une relation espacement de telle façon qu'un intervalle est formé entre la première et la seconde portion, l'appareil de scopie chirurgicale étant reçu dans l'intervalle et établissant un contact avec la première portion et la seconde portion quand l'appareil de scopie chirurgicale est inséré dans la seconde cavité (37) à travers la seconde entrée (18, 109).

10. Dispositif selon l'une quelconque des revendications 1 à 9, dans lequel l'élément chauffant (303) est un élément chauffant électrique du type à résistance (303) incorporé dans un circuit électrique, dans lequel de préférence le circuit électrique comprend une carte à circuits imprimés (139) et/ou une thermistance (306) pour commander la température du fluide de nettoyage (34) à l'intérieur du boîtier (19, 103).

11. Dispositif selon la revendication 10, dans lequel le circuit ajuste par voie électronique la variation de tension au cours de la vie de la batterie (300) par modification de largeur d'impulsion et/ou dans lequel la thermistance (306) et l'élément chauffant (303) sont incorporés dans une unique carte à circuits imprimés (139).

12. Dispositif de nettoyage et de désembuage à utiliser avec un appareil de scopie chirurgicale pendant des procédures médicales, le dispositif comprenant :

un boîtier (19, 103) définissant une première cavité (28) et une seconde cavité (37), la première cavité (28) étant configurée et agencée pour recevoir un appareil de scopie chirurgicale dans une orientation généralement verticale, la seconde cavité (37) étant configurée et agencée pour recevoir un appareil de scopie chirurgicale dans une configuration généralement horizontale, la première cavité (28) et la seconde cavité (37) étant disposées en communication fluidique, le boîtier (19, 103) ayant une première entrée (13, 106) communiquant avec la première cavité (28) pour permettre d'insérer une extrémité distale de l'appareil de scopie chirurgicale jusque dans la première cavité (28) à travers la première entrée (13, 106), le boîtier (19, 103) ayant une seconde entrée communiquant avec la seconde cavité (37) pour permettre d'insérer une extrémité distale de l'appareil de scopie chirurgicale jusque dans la seconde cavité (37) à travers la seconde entrée ;
un liquide de nettoyage (34) disposé dans la première cavité (28) et dans la seconde cavité (37) et capable de se déplacer entre celles-ci ;
un élément chauffant (303) disposé dans le boîtier (19, 103) de telle sorte que de la chaleur est transférée depuis l'élément chauffant (303) vers le fluide de nettoyage (34) ;
une source de puissance (300) configurée et agencée pour alimenter l'élément chauffant (303) afin de produire de la chaleur pour chauffer le fluide de nettoyage (34) ; et
dans lequel un matériau de référence pour équilibrage de blanc (40, 133) est disposé dans la seconde cavité (37) au-dessus du niveau du fluide de nettoyage (34).

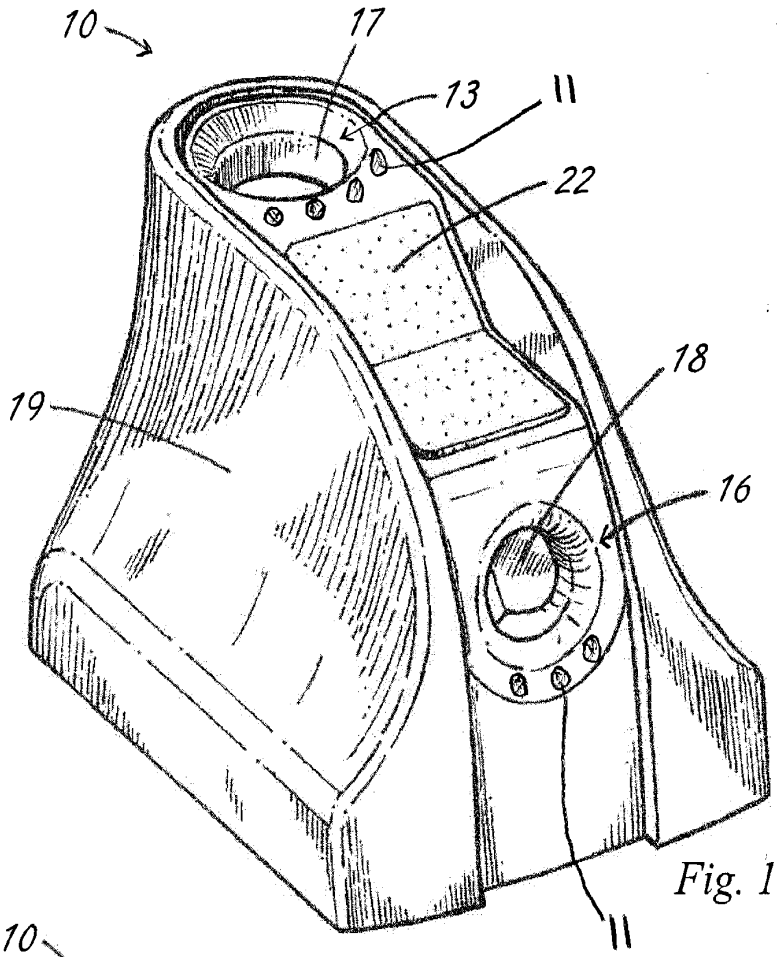
13. Dispositif de nettoyage et de désembuage à utiliser avec un appareil de scopie chirurgicale pendant des procédures médicales, le dispositif comprenant :

un boîtier (19, 103) définissant une première cavité (28) et une seconde cavité (37), la première cavité (28) étant configurée et agencée pour recevoir un appareil de scopie chirurgicale dans une orientation généralement verticale, la seconde cavité (37) étant configurée et agencée pour recevoir un appareil de scopie chirurgicale dans une configuration généralement horizontale, la première cavité (28) et la seconde cavité (37) étant disposées en communication fluidique, le boîtier (19, 103) ayant une première entrée (13, 106) communiquant avec la première cavité (28) pour permettre d'insérer une extrémité distale de l'appareil de scopie chirurgicale jusque dans la première cavité (28) à travers la première entrée (13, 106), le boîtier (19, 103) ayant une seconde entrée communiquant avec la seconde cavité (37) pour permettre d'insérer une extrémité distale de l'appareil de scopie chirurgicale jusque dans la seconde cavité (37) à travers la seconde entrée ;
un premier matériau de nettoyage disposé dans la première cavité (28) ;
un matériau de référence pour équilibrage de blanc (40, 133) disposé dans le boîtier (19, 103) et configuré et agencé pour effectuer un équilibrage de blanc (40, 133) d'un appareil de scopie chirurgicale disposé dans le boîtier (19, 103) ;
un fluide de nettoyage (34) disposé dans la première cavité (28) ;
un circuit électrique ayant un élément chauffant (303) fonctionnellement associé à celui-ci, l'élément chauffant (303) étant disposé dans le boîtier (19, 103) de telle façon que de la chaleur est transférée depuis l'élément chauffant (303) vers le fluide de nettoyage (34) ;
une source de puissance (300) configurée et agencée pour alimenter l'élément chauffant (303) afin de produire de la chaleur pour chauffer le fluide de nettoyage (34) ;
dans lequel le boîtier (19, 103) comprend un premier boîtier annexe (127) et un second boîtier annexe disposé à l'intérieur, le premier boîtier annexe (127) ayant une surface supérieure et ayant une cavité de premier boîtier annexe dé-

finie à l'intérieur, l'élément chauffant (303) étant disposé sur la surface supérieure, la source de puissance (300) étant disposée dans la cavité du premier boîtier annexe, le second boîtier annexe formant la première cavité (28) et ayant une surface extérieure en forme de V configurée et agencée pour recevoir le matériau de référence pour équilibrage de blanc.

14. Dispositif selon la revendication 13, dans lequel la surface supérieure du premier boîtier annexe (127) est disposée au-dessous de la première cavité (28) dans le boîtier (19, 103) pour chauffer le fluide de nettoyage (34).

15. Dispositif selon les revendications 13 ou 14, dans lequel le circuit électrique comprend une carte à circuits imprimés (139).


10
17
13
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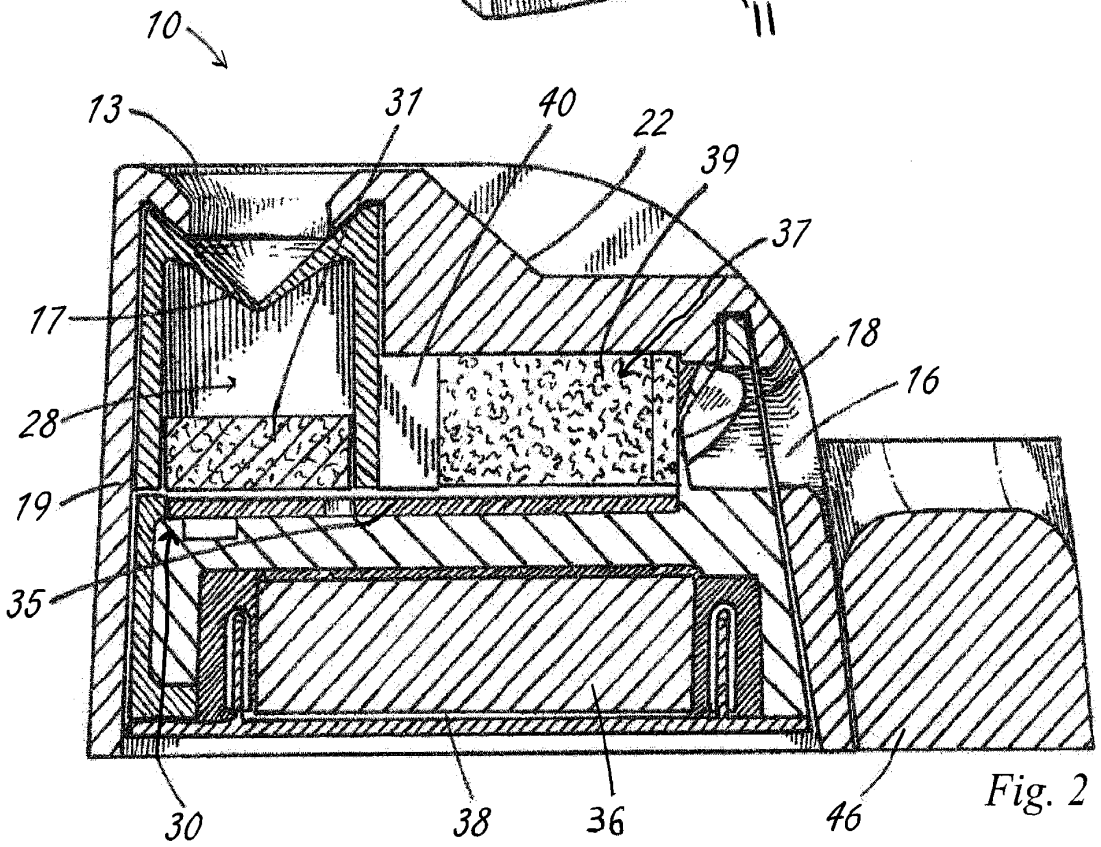
18
19
16
II
II

Fig. 1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46

Fig. 2

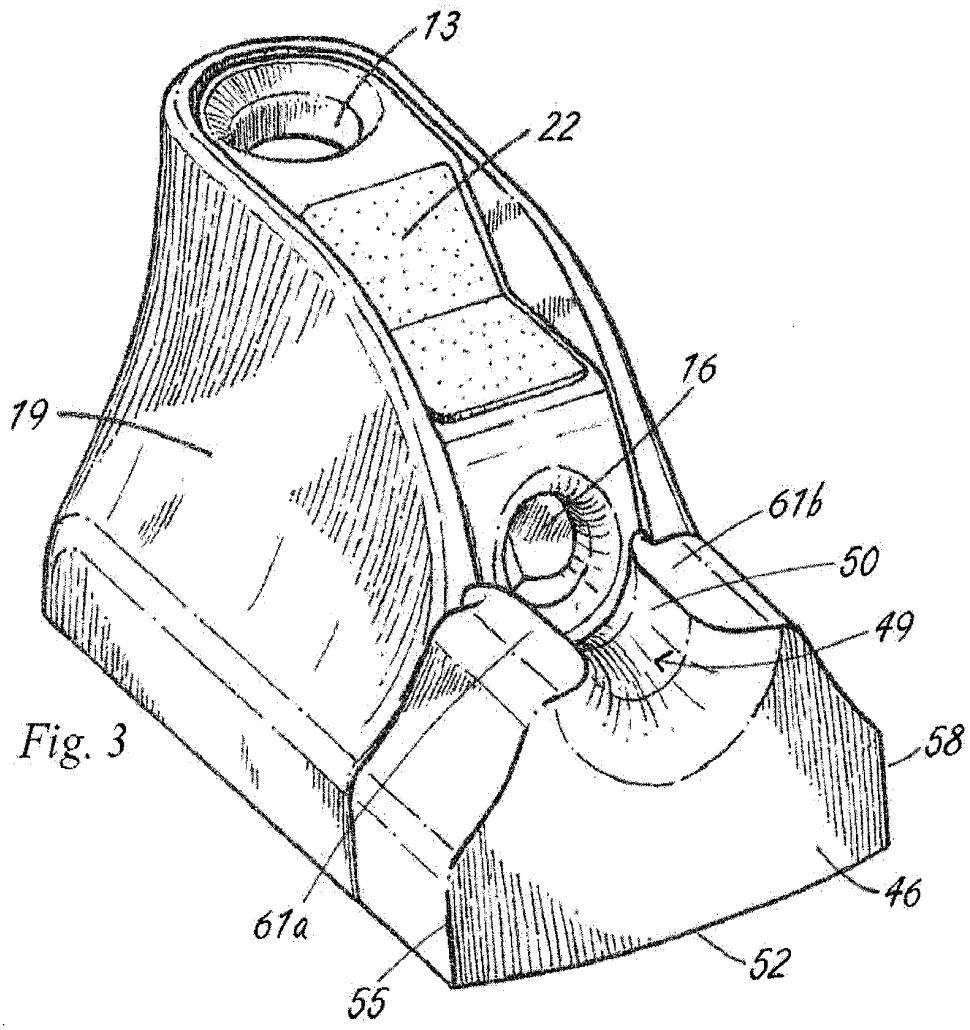


Fig. 3

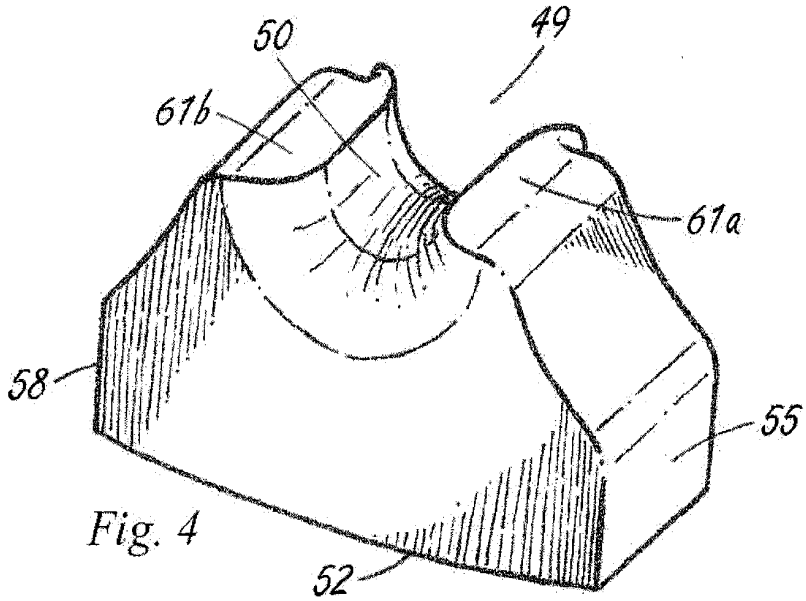
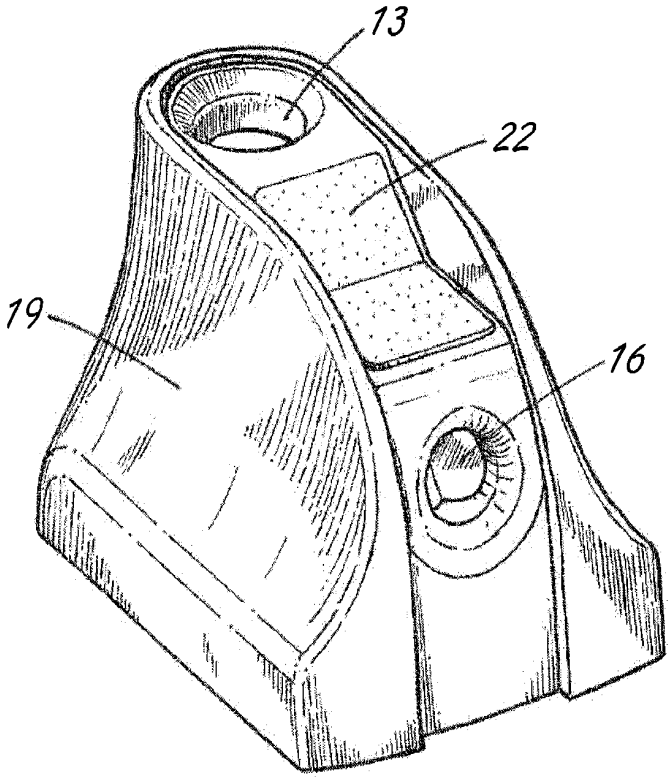


Fig. 4



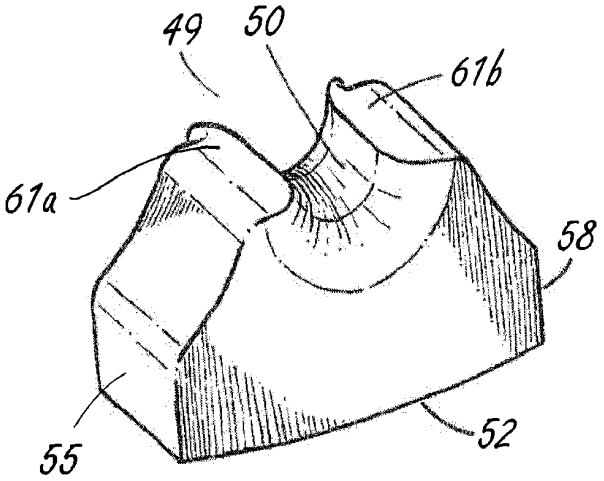


Fig. 5

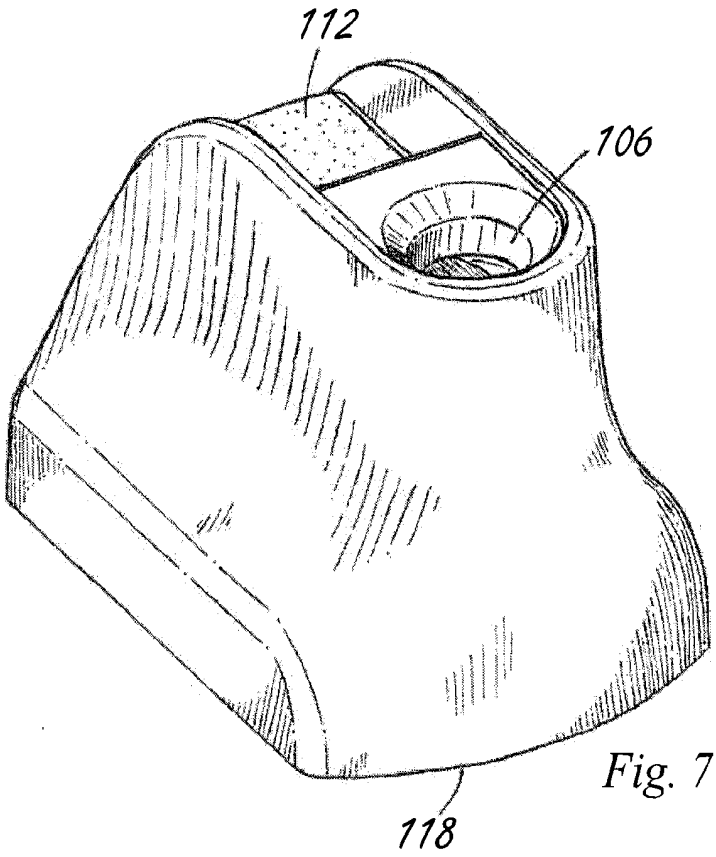


Fig. 7

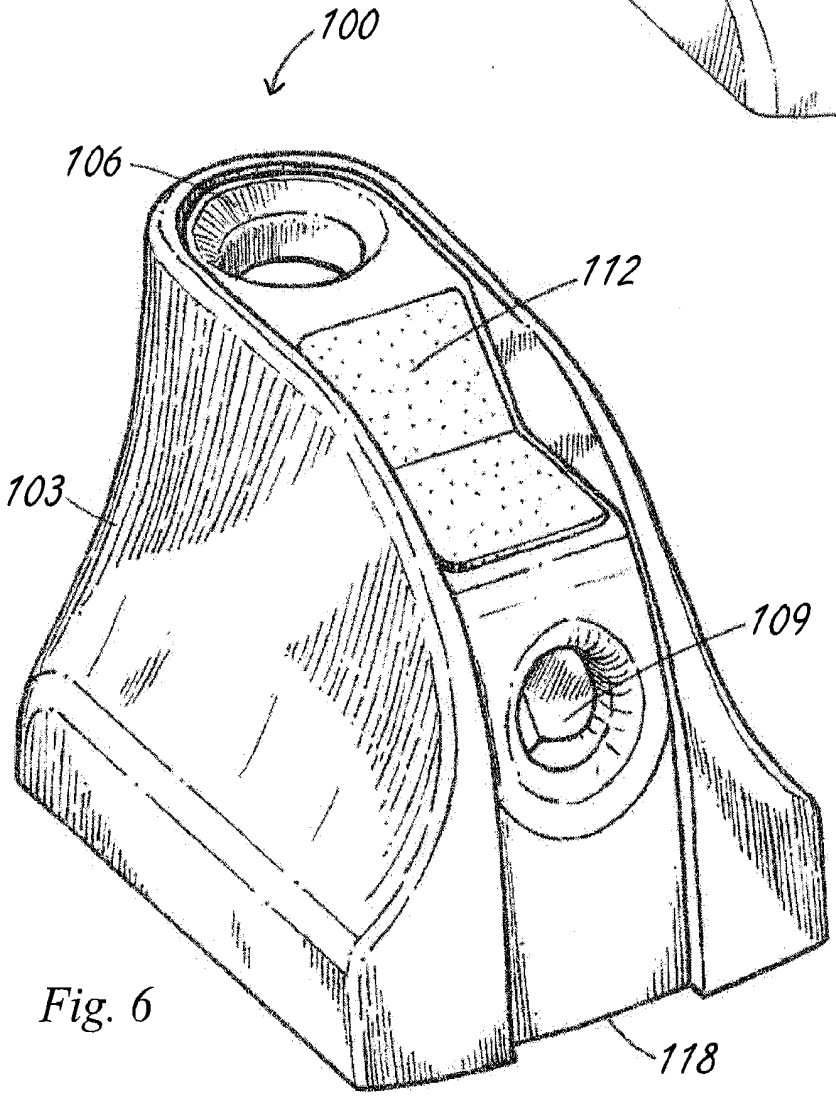


Fig. 6

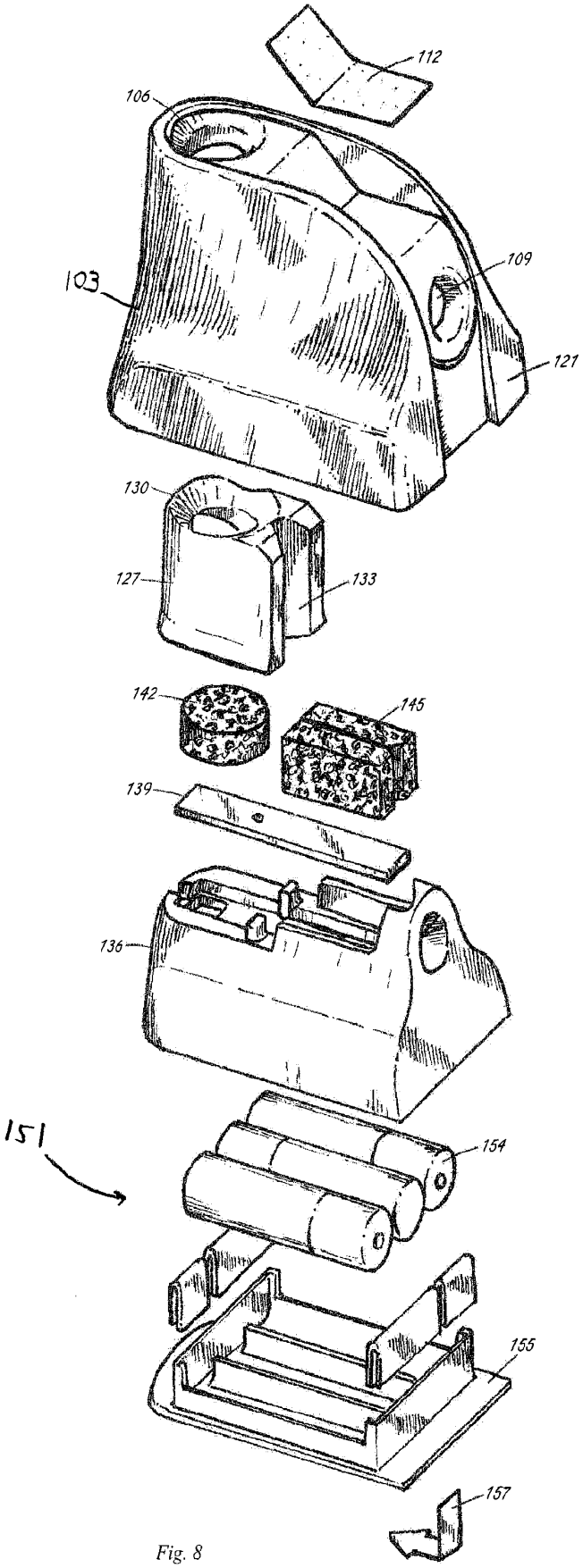


Fig. 8

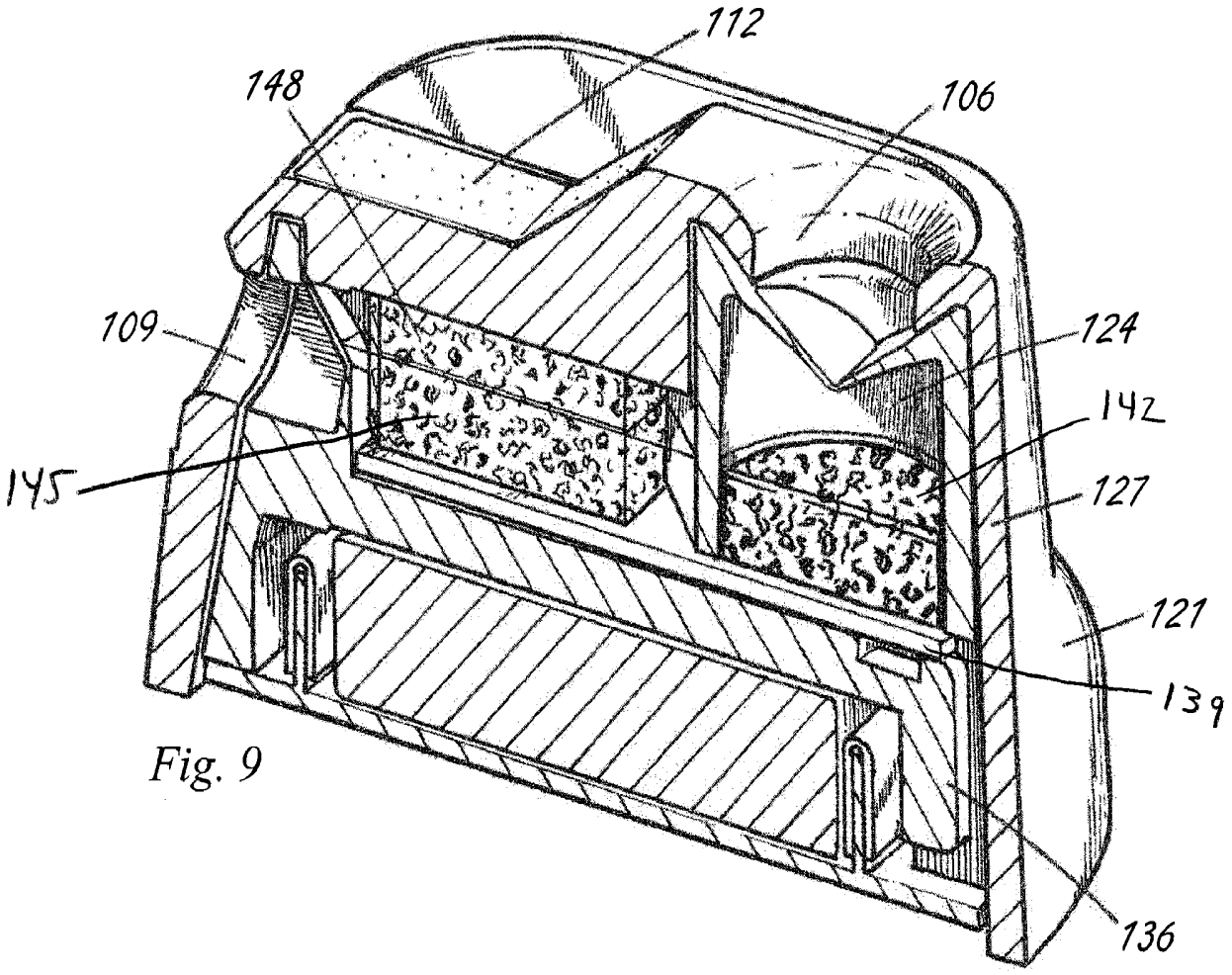


Fig. 9

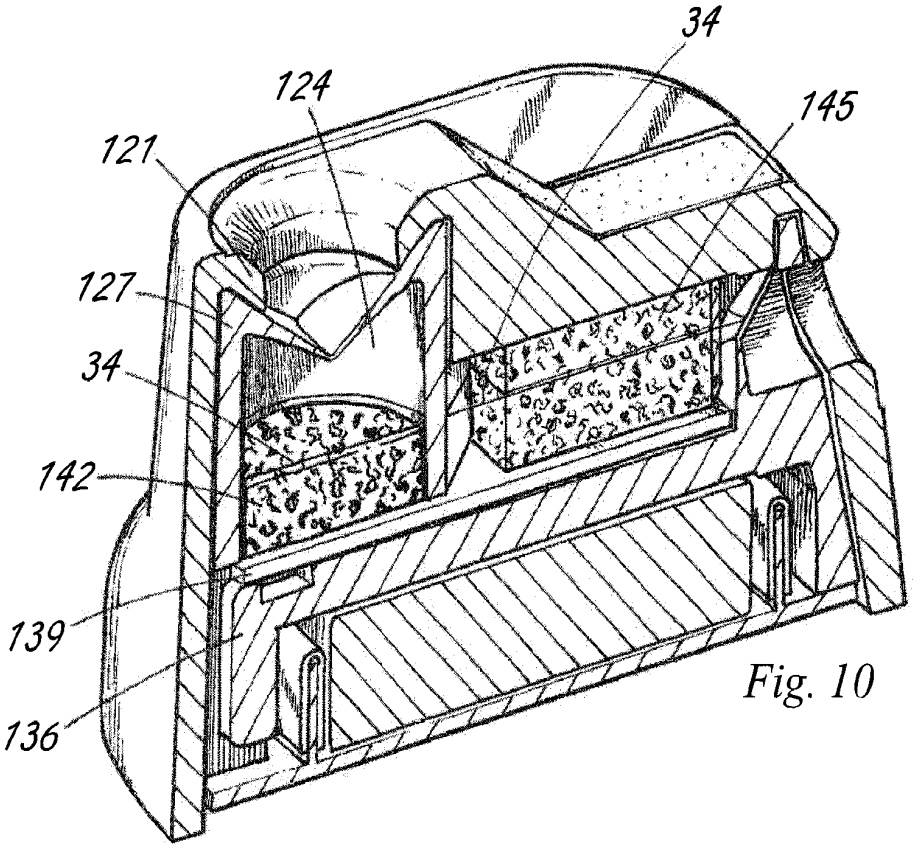


Fig. 10

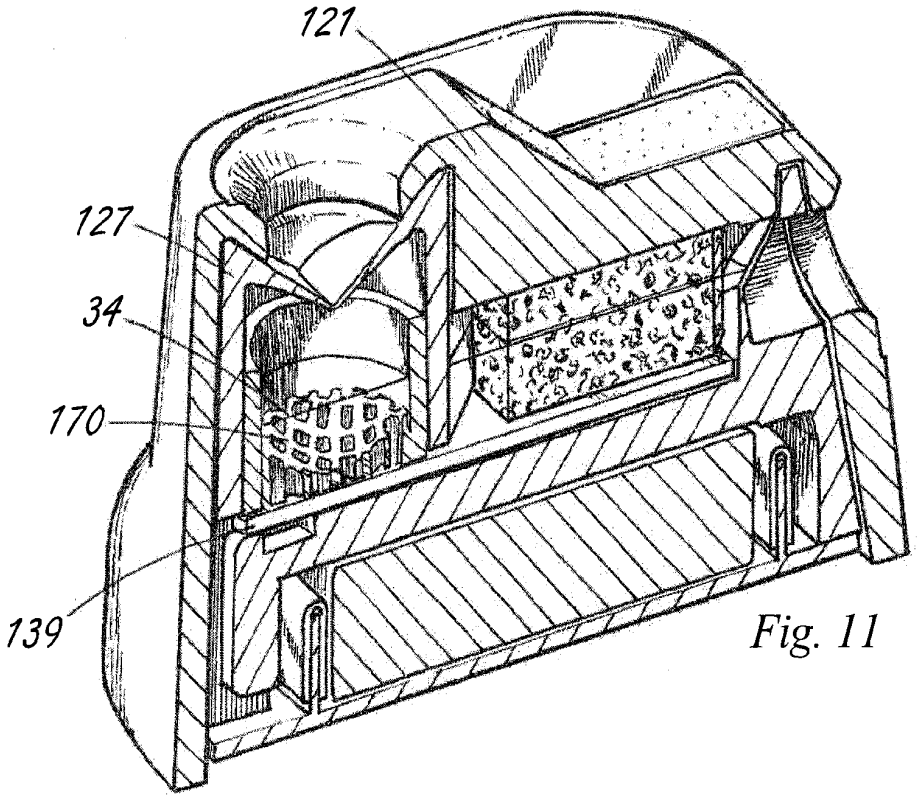


Fig. 11

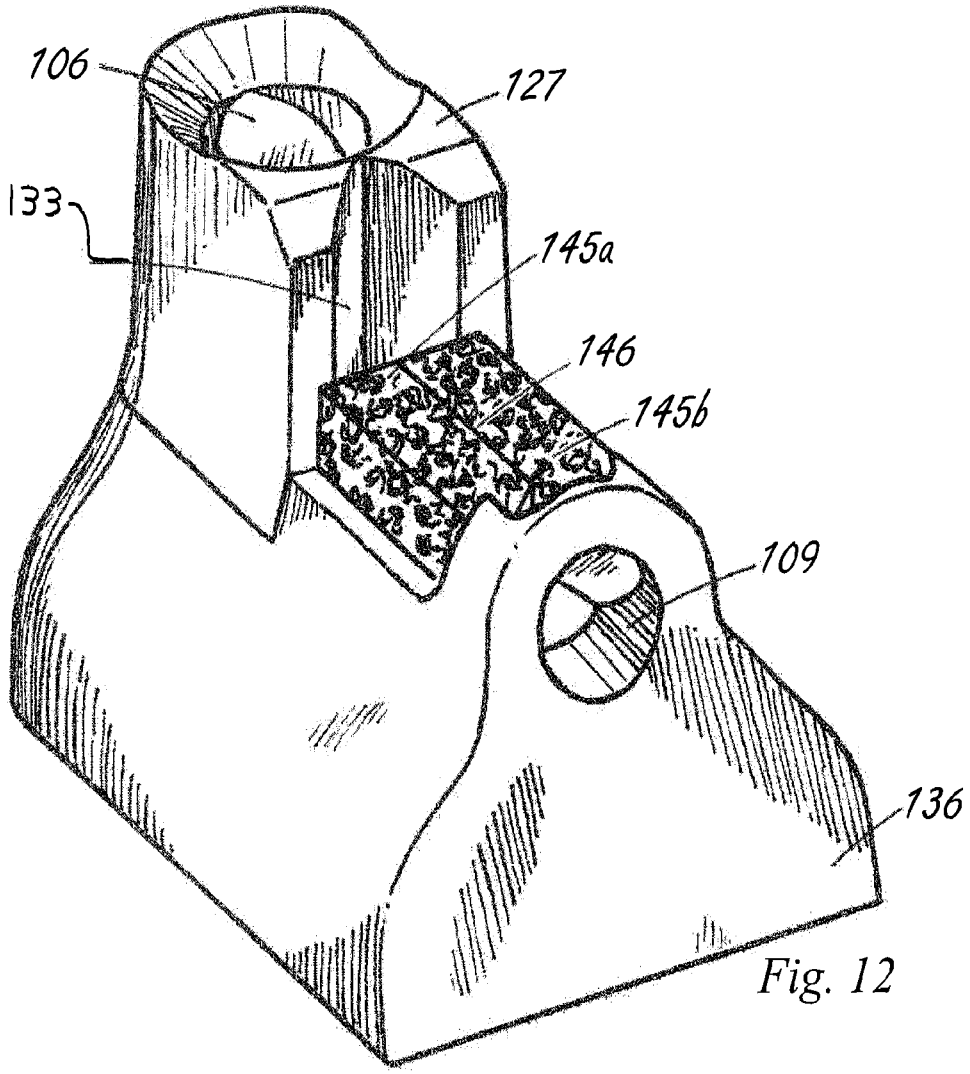


Fig. 12

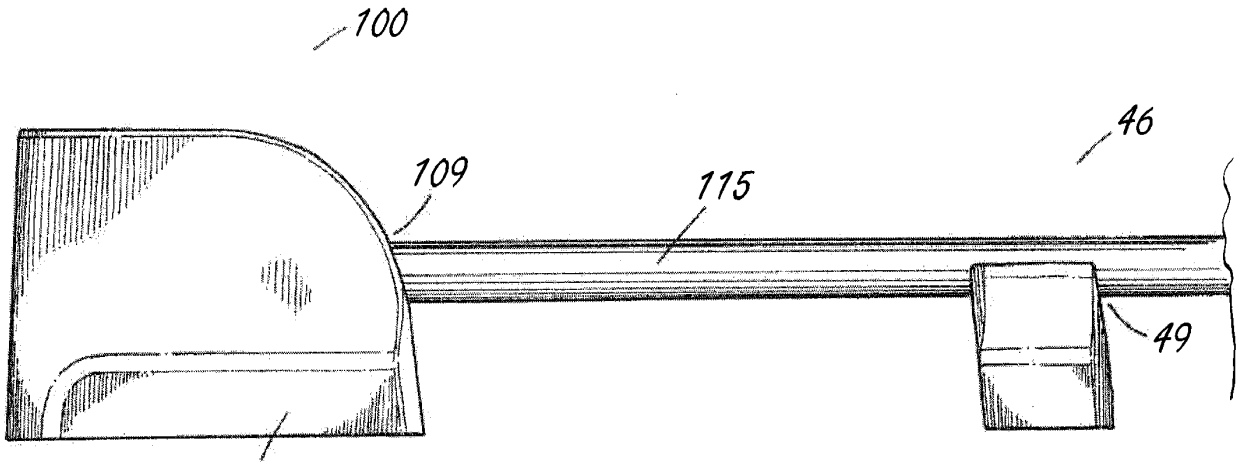


Fig. 13

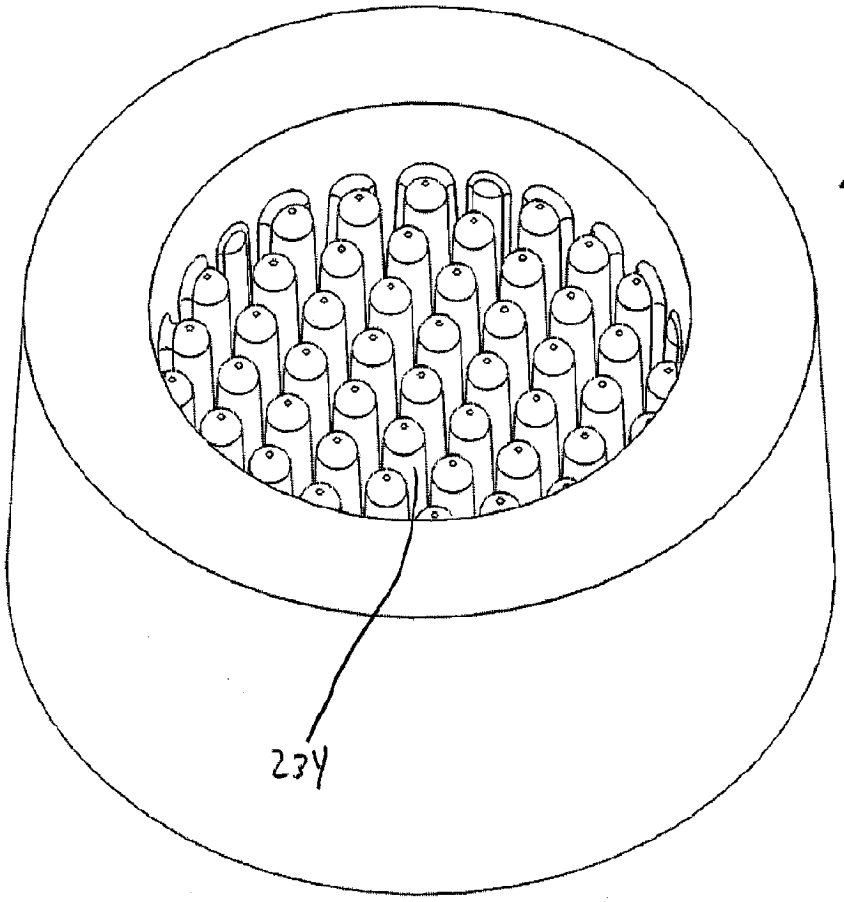


FIG. 14A

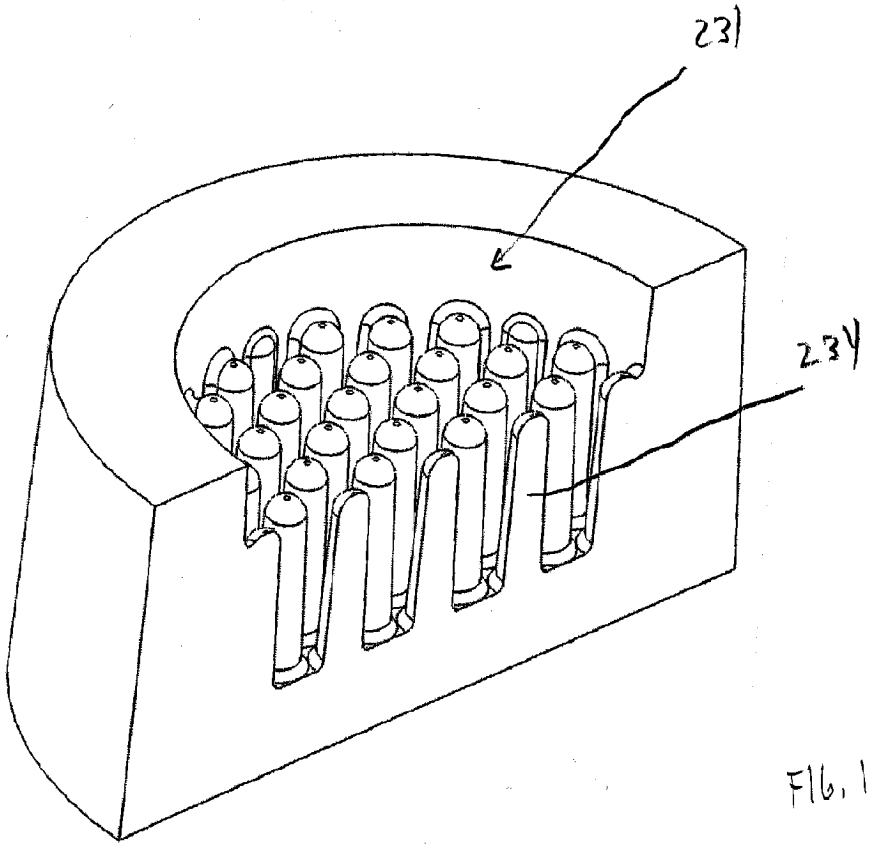


FIG. 14B

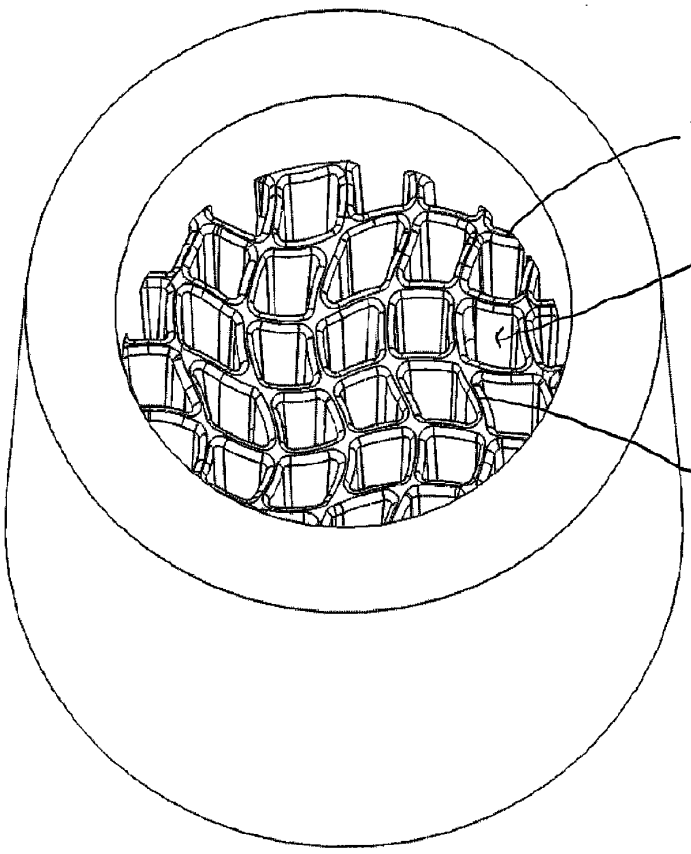


FIG. 15A

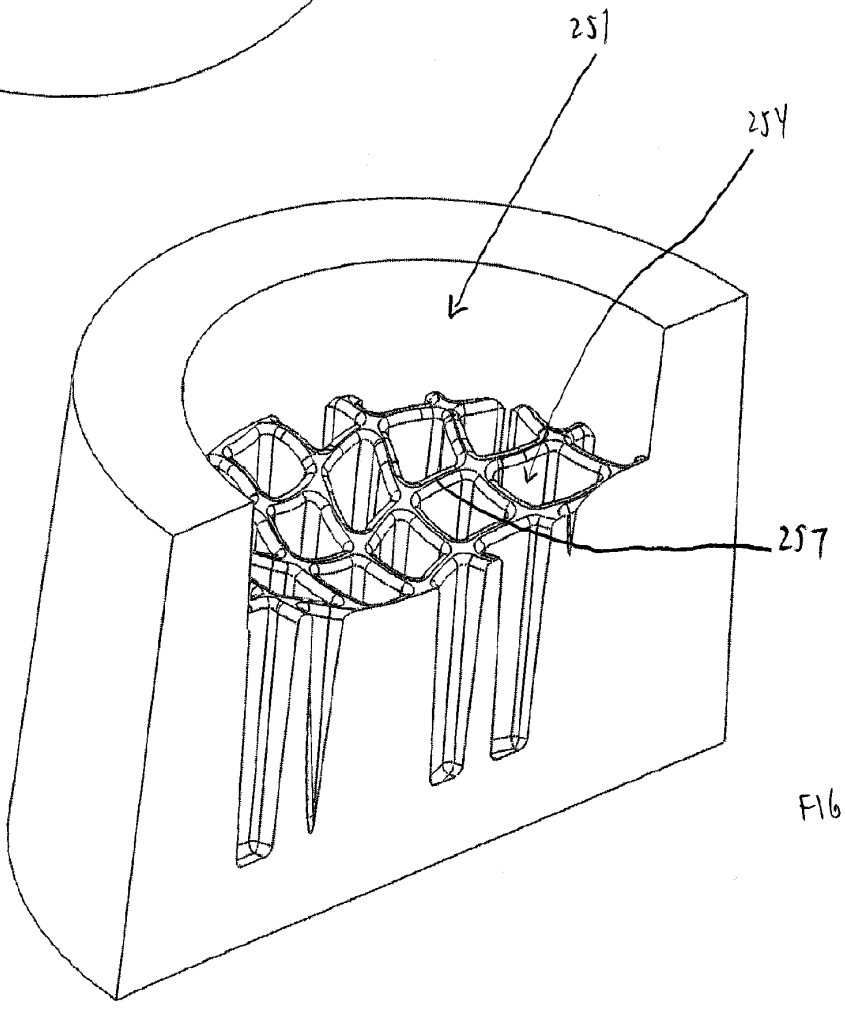


FIG. 15B

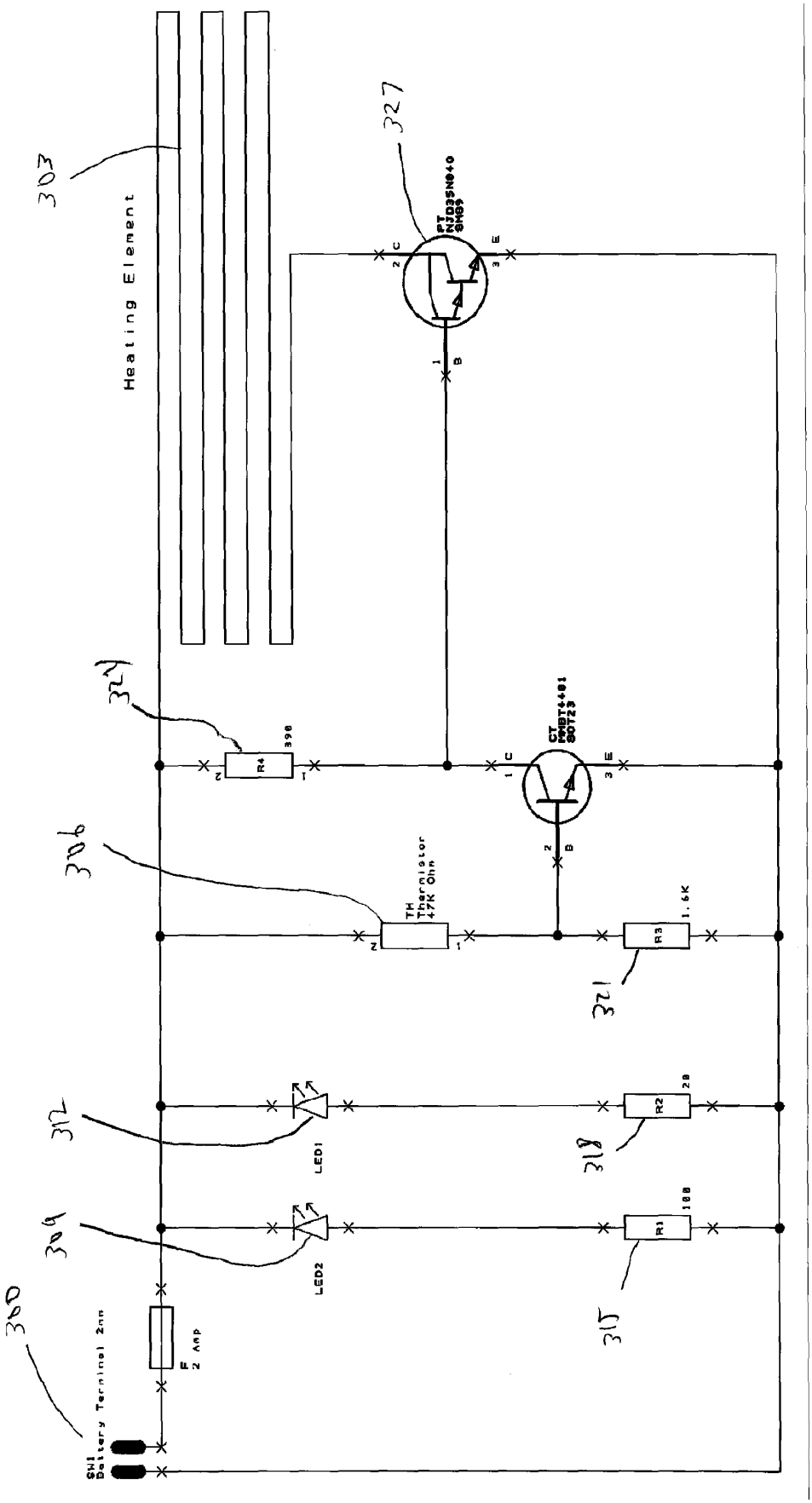

303
Heating Element
327
PT
NJD35N040
SMD
C
E
B
329
R4
330
CT
MMBT4401
SOT23
306
TH
Thermistor
47K Ohm
R3
1.6K
321
312
LED1
R2
20
318
309
LED2
R1
100
315
300
SW1
Battery Terminal 2mm
F1
2 Amp

Fig. 16

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 8152717 B **[0002]**